ANNUAL STREAM FLOW VARIABILITY OVER THE WESTERN UNITED STATES

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ABSTRACT

The variability of mean annual streamflow over the western United States is described and related to indices of large scale atmospheric circulation over the Pacific Ocean and western U.S. Principal component analysis reveal four statistically significant modes of streamflow variability across the region. The first pattern (PC1) showed opposite anomalies in the northwest in comparison to the southwest. Loadings of this pattern are very high over the Pacific northwest. The second component (PC2) shows strong loadings in central California and the great basin, decreasing to both the north and south. The third pattern (PC3) exhibited high loadings in the northern Great Plains while loadings of the fourth component (PC4) are concentrated in the central and southern Rocky mountains. Correlations of the P.C. scores with the southern Oscillation Index (SOI) and an index of the Pacific/North America (PNA) circulation pattern. The SOI relates most strongly to PC1 indicating that the opposition pattern is most strongly related to the Southern Oscillation. The PNA in various months relate in a statistically significant to several of the component patterns.

An analysis at individual stations using a split sample indicates low streamflow in the northwestern US during ENSO events is, on average, associated with below average flow in the southwest. The variance of flow during ENSO years in uniformly higher then during non ENSO years. These differences are statistically significant in many cases. When compared to similar analyses of precipitation, the effect of climate anomalies appears to be amplified in the stremflow record.